



**Fiscal Year 2009  
President's Budget Request for  
Science & Technology  
And  
Research & Engineering**

***Principal Deputy  
Defense Research and Engineering***

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***Any Battlefield includes  
physical, cyber, space,  
undersea, etc***

***Any Adversary includes both State and non-State actors***



# Building the Science and Engineering Base



- We need to continually develop, mature and field technology to stay ahead of our adversaries
- President Bush acknowledged the importance of science and engineering development in his January 2008 State of the Union address

***“To keep America competitive into the future, we must trust in the skill of our scientists and engineers and empower them to pursue the breakthroughs of tomorrow... I ask Congress to double federal support for critical basic research in the physical sciences and ensure America remains the most dynamic nation on Earth..”***

***President George W. Bush, State of the Union address, January 28, 2008***

***“As changes in this century’s threat environment create strategic challenges – irregular warfare, weapons of mass destruction, disruptive technologies – this request places greater emphasis on basic research, which in recent years has not kept pace with other parts of the budget.”***

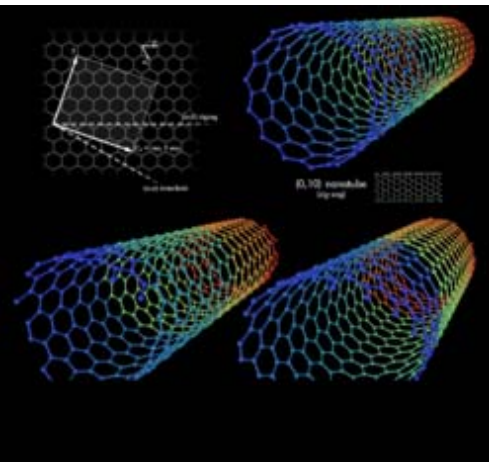
***Secretary of Defense Posture Statement on the FY09 Budget, February 2008***



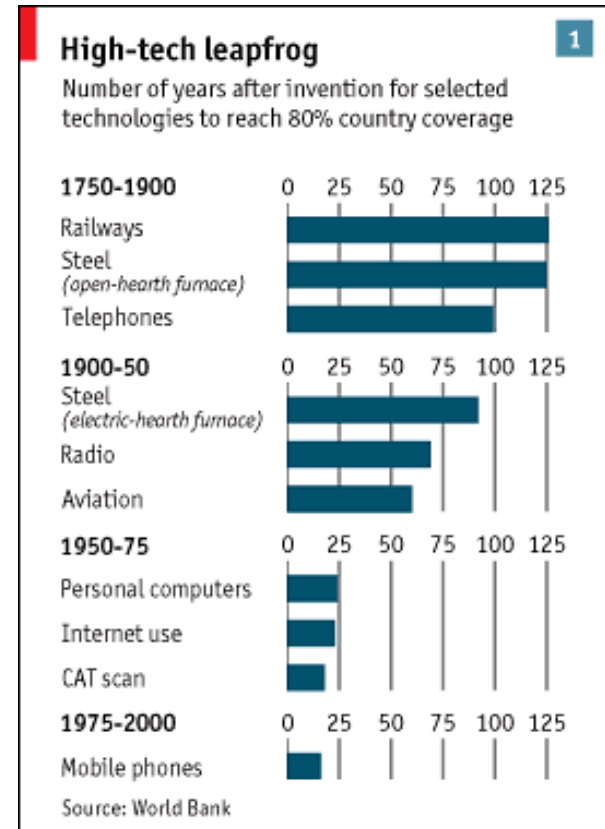
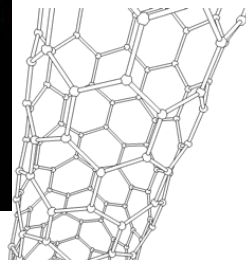
# Pace of Technology Continues to Increase



- Time between modeling of semiconducting properties of germanium in 1931 and first commercial product (*transistor radio*) was 23 years
- Carbon nanotube
  - Discovered by Japan (1991)
  - Researchers recognized carbon nanotubes were excellent sources of field-emitted electrons (1995)
  - “Jumbotron lamp” - nanotube-based light source available as commercial product (2000)



Nanotechnology – Rapid Technology Evolution/Application Cycle



Source: The Economist, Feb. 9, 2008



# Overview

- **PBR09 R&E budget**
- **Budget changes and historical context**
- **Strategic foundation**
  - Quadrennial Defense Review
  - Director, Defense Research and Engineering Priorities
- **DDR&E interest items**
- **OSD / DDR&E programs**

***PBR09—Continued growth of “non-kinetic”, non-platform specific capabilities***



# **PBR09 R&E Budget**



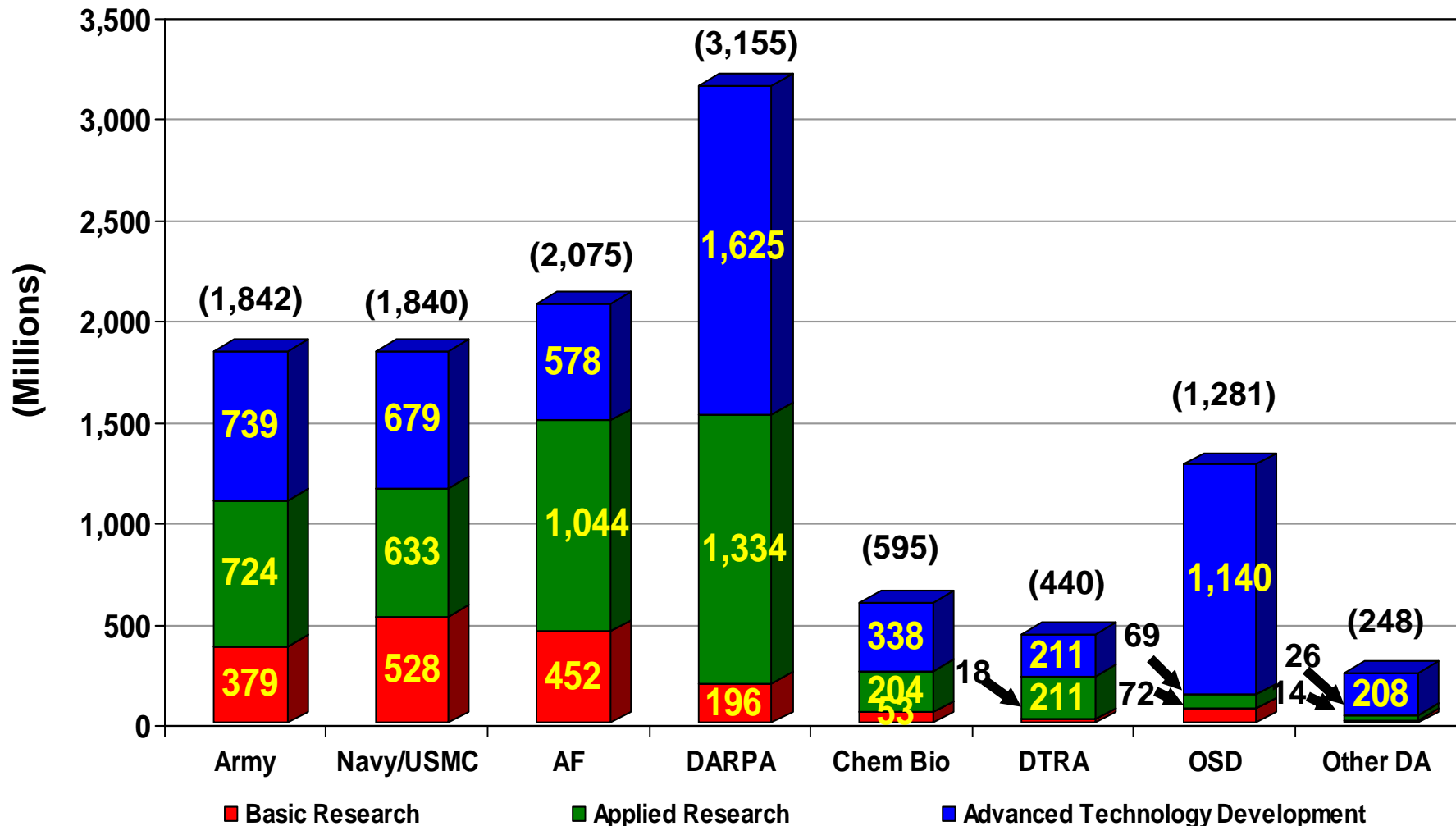
# FY09 DoD S&T Budget Request



Total FY09 S&T request = \$11.48B

Total FY08 S&T Request = 10.77B

Army = 1,728 Navy = 1,667 AF = 1,964 DARPA = 3,033 ChemBio = 610 DTRA = 401 OSD = 1,166 Other DA = 201





# FY09 DoD R&E Budget Request Comparison



	FY08 PBR	FY08 Approp	FY09 PBR (Constant Year FY08)	Real Change from PBR (In CY \$)
Basic Research (BA 1)	1,428	1,634**	1,699 (1,662)	+16.4%
Applied Research (BA 2)	4,357	5,092	4,245 (4,153)	-4.7%
Advanced Technology Development (BA 3)	4,987	6,043	5,532 (5,412)	+8.5%
<b>DoD S&amp;T</b>	<b>10,772</b>	<b>12,768</b>	<b>11,475 (11,227)</b>	<b>+4.2%</b>
Advanced Component Development and Prototypes (BA 4)	15,662	15,947	15,774 (15,431)	-1.5%
<b>DoD R&amp;E (BAs 1 – 4)</b>	<b>26,434</b>	<b>28,716</b>	<b>27,249 (26,657)</b>	<b>+0.9%</b>
<b>DoD Topline</b>	<b>481,554</b>	<b>569,000</b>	<b>515,400 (502,486)</b>	<b>+4.3%</b>

**Note:** The PBR09 budget documentation miscoded the Air Force Tanker Replacement program as BA 1 vice BA 7, misstating the BA 1 total to be \$1,784M. \$1,634 is the correct amount.

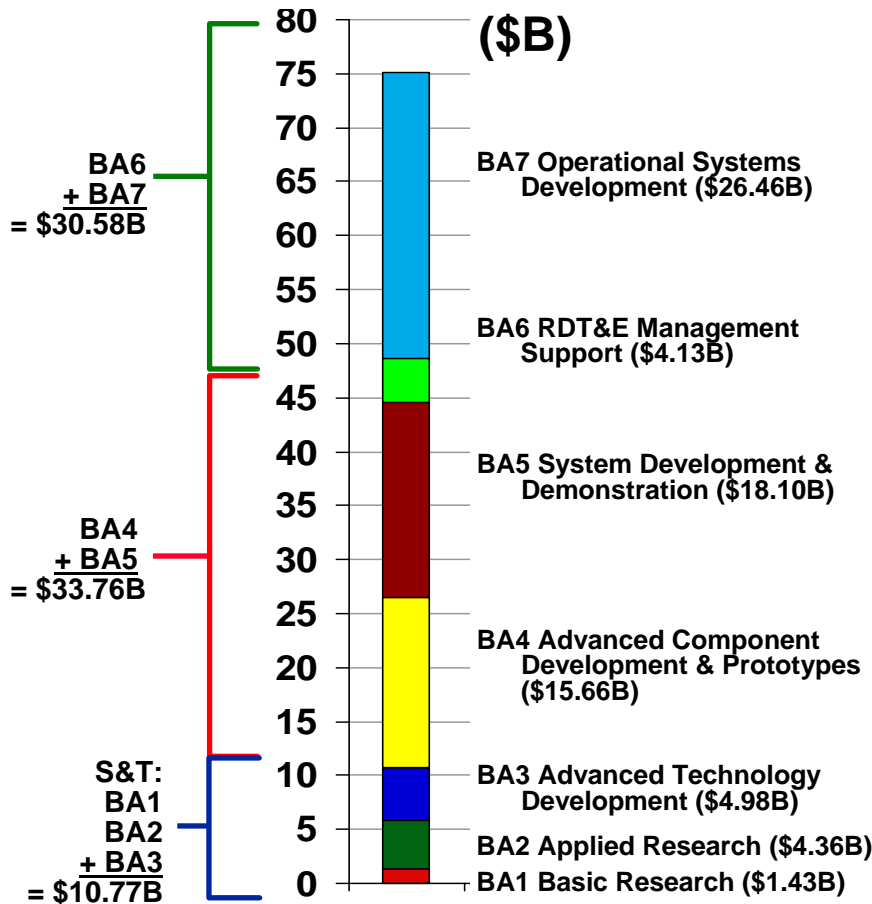
**FY09 President's Budget Request is increasing the technology base**

# FY08 and FY09 RDT&E Budget Request Comparison

## - in Then Year Dollars -



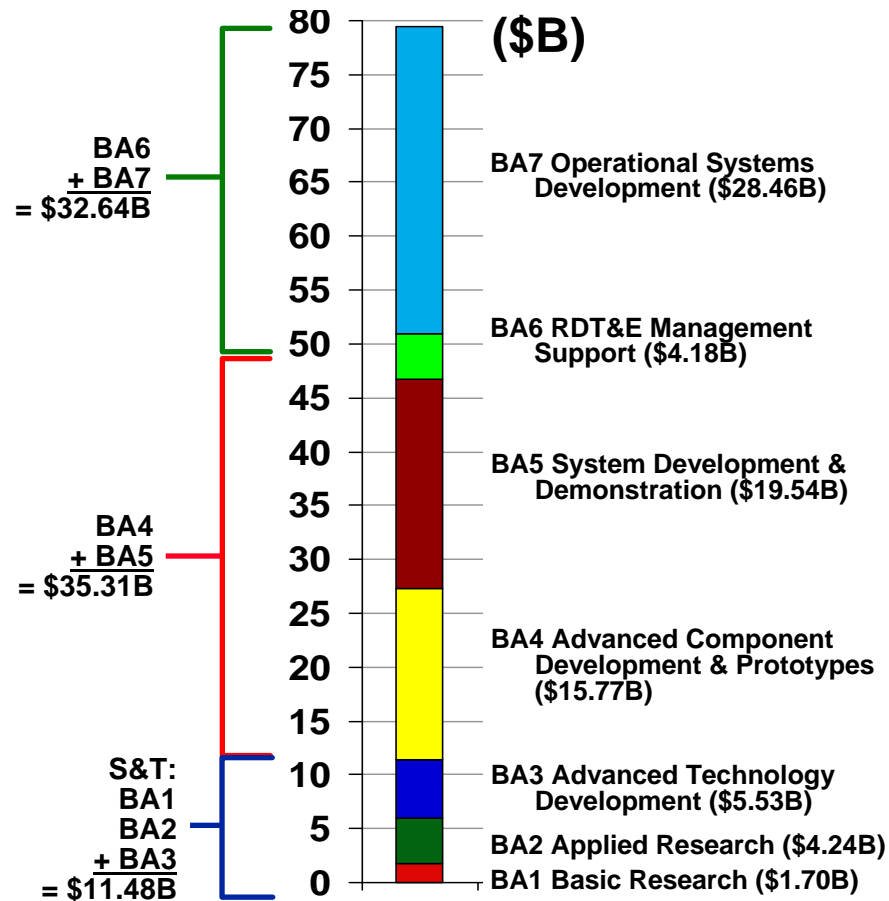
**FY08 RDT&E request = \$75.12B**  
(Budget Activities 1-7)



Technology Base (BA1 + BA2) = \$5.78B

**PBR08 S&T is 14.3% of RDT&E**

**FY09 RDT&E request = \$79.43B**  
(Budget Activities 1-7)



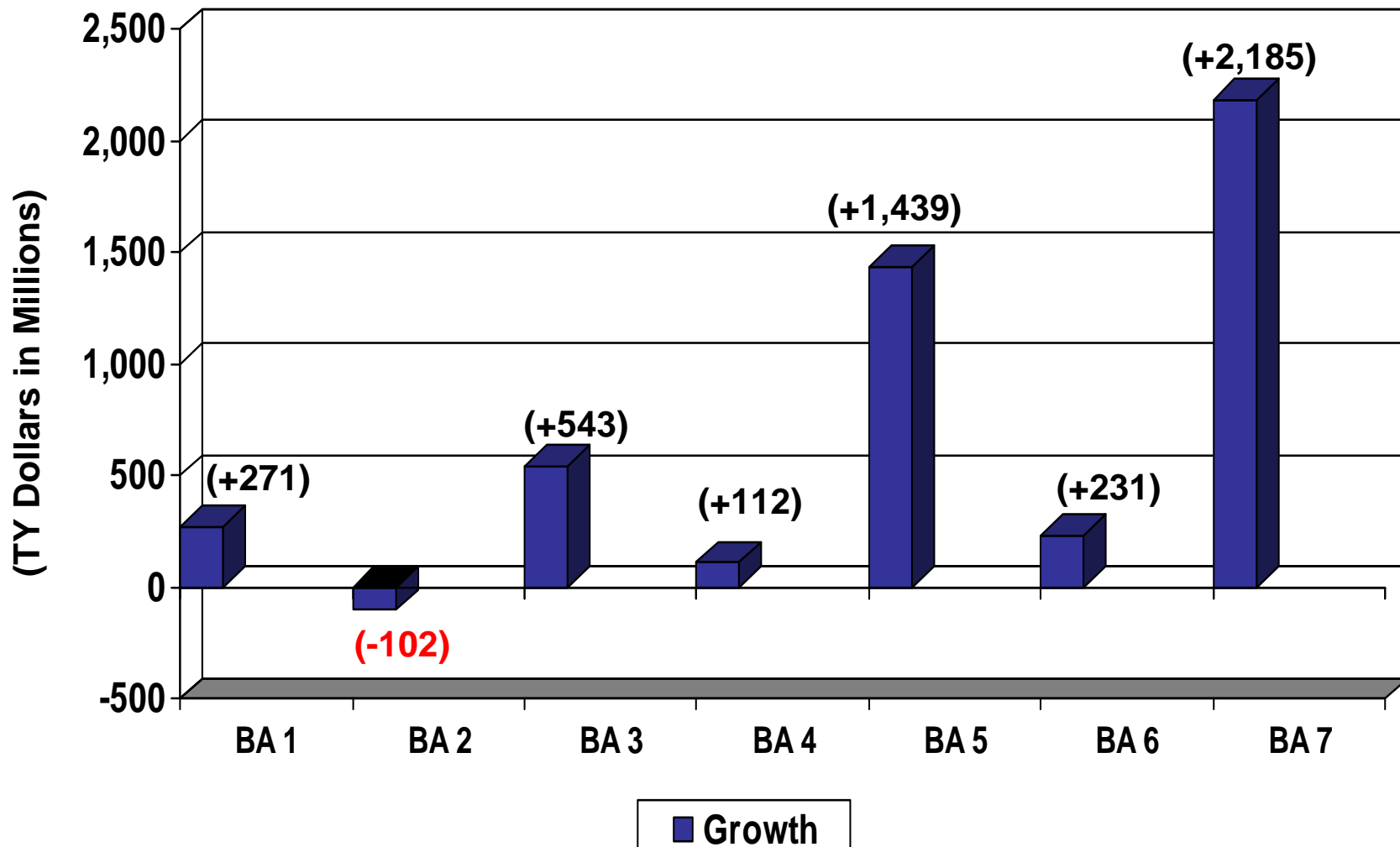
Technology Base (BA1 + BA2) = \$5.94B

**PBR09 S&T is 14.5% of RDT&E**



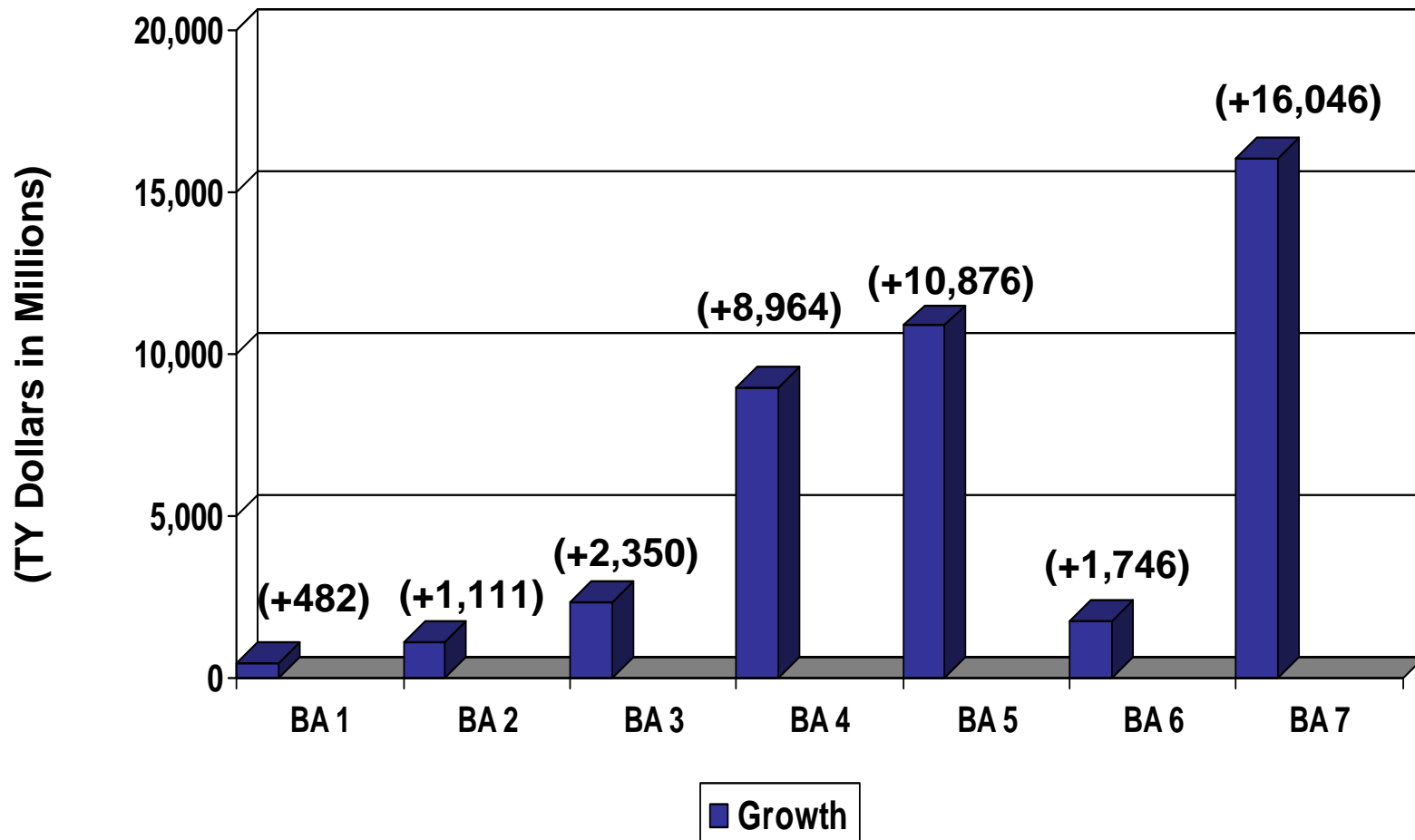
# RDT&E Budget Request Growth

## - FY08 and FY09 Comparison -



# RDT&E Budget Request Growth

## - FY01 and FY09 Comparison -





# Budget Changes and Historical Context

# PBR09 S&T Request Addresses Capability Gaps



- PBR09 S&T Request continues the realignment initiated in FY08 to address capability gaps identified in the 2006 QDR
  - Special (“non-kinetic”/enabling) technologies:
    - Clandestine Tagging, Tracking and Locating
    - Biometrics
    - Human, Cultural, Social Behavior Modeling
    - Networks
    - Persistent Surveillance
  - Technologies to decrease energy consumption/increase alternatives
  - Combat and tactical armor for protection against a range of threats
  - Accelerating transition to fielded systems

***Investment shifted away from platform-specific technologies***

# PBR09 S&T Request Addresses Capability Gaps (Cont'd)



- New technology/emphasis areas
  - \$270M increase to Basic Research
    - SecDef initiative to increase peer-reviewed basic research
      - To develop innovative solutions
      - Enhance the science and engineering personnel base
    - Increase will support targeted focus areas for
      - Early to mid-career scientists and engineers with a team of students and post docs
      - Single Investigator awards with larger grants
  - Emphasis will be on emerging technology areas, e.g.,
    - Cyber protection and information assurance
    - Biosensors and biometrics
    - Human sciences (cultural, cognitive, behavioral, neural)
    - Software sciences and materials
    - Immersive sciences for training and mission rehearsal
    - Power and energy management
  - Anticipate about 500 focused research efforts



# PBR09 S&T Request Addresses Capability Gaps (*Cont'd*)



- New technology/emphasis areas (*Cont'd*)
  - Increased protection for dismounted troops and ground forces
  - Research in plasma and meta-materials to address emerging threats
  - Cyber protection \*\*
  - Hypersonics/Prompt Global Strike (Blackswift) – New technology prototype \*\*

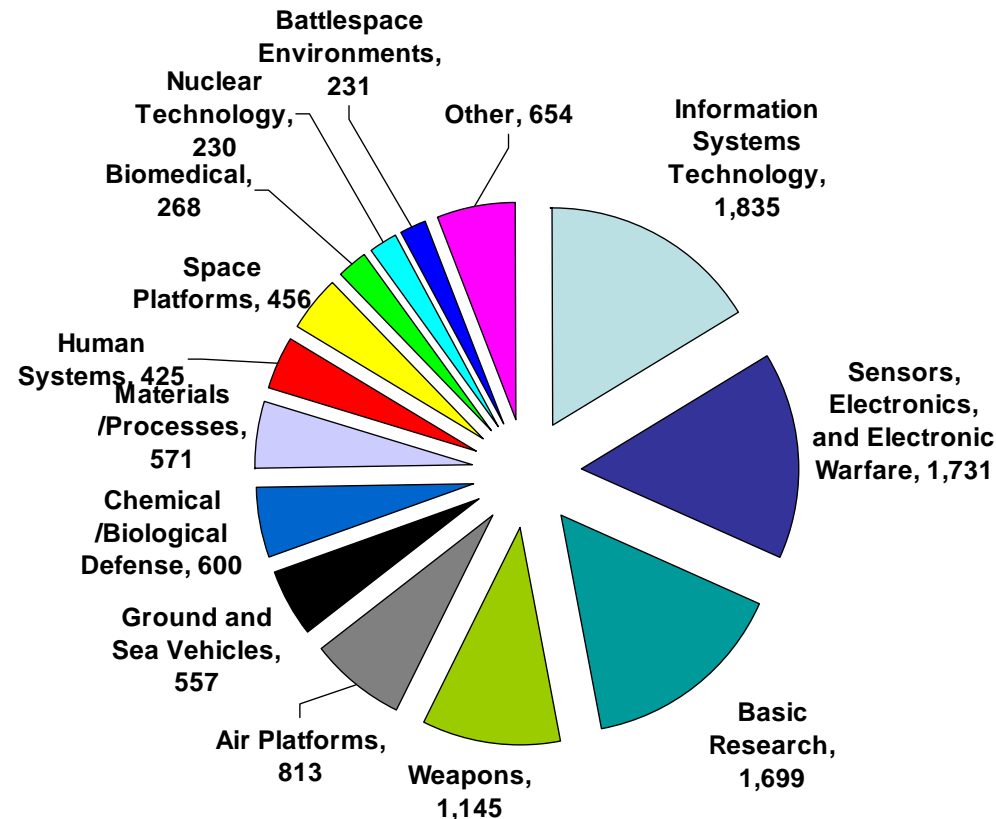
\*\* **Note:** *Cyber protection is funded in DARPA BA 6  
Air Force funding for Blackswift is in BA 7*

# Characterization of the FY09 DoD S&T Program



## • Funding

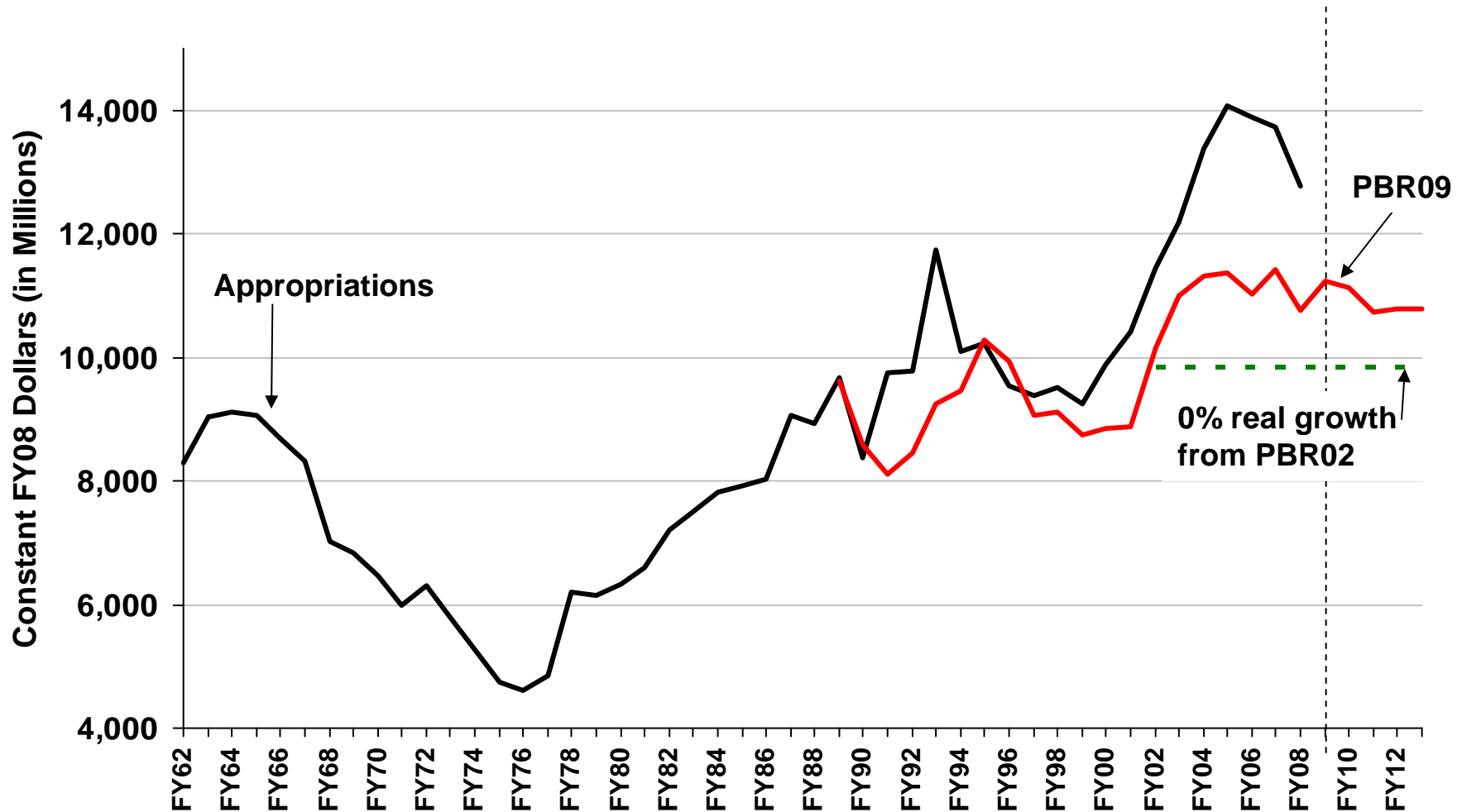
- Current year S&T dollars: \$10.77B FY08 to \$11.48B FY09
- Percent of DoD funding: 2.24% FY08 to 2.22% FY09
- Over 50% of total investment in 4 functional areas:
  - Information Systems (1.8B)
  - Sensors, Electronics / EW (1.7B)
  - Basic Research (1.7B)
  - Weapons (1.1B)



***DoD S&T program is focused on “sensing and shooting”***

# DoD S&T – Historical Context

## - In FY08 Constant Dollars -



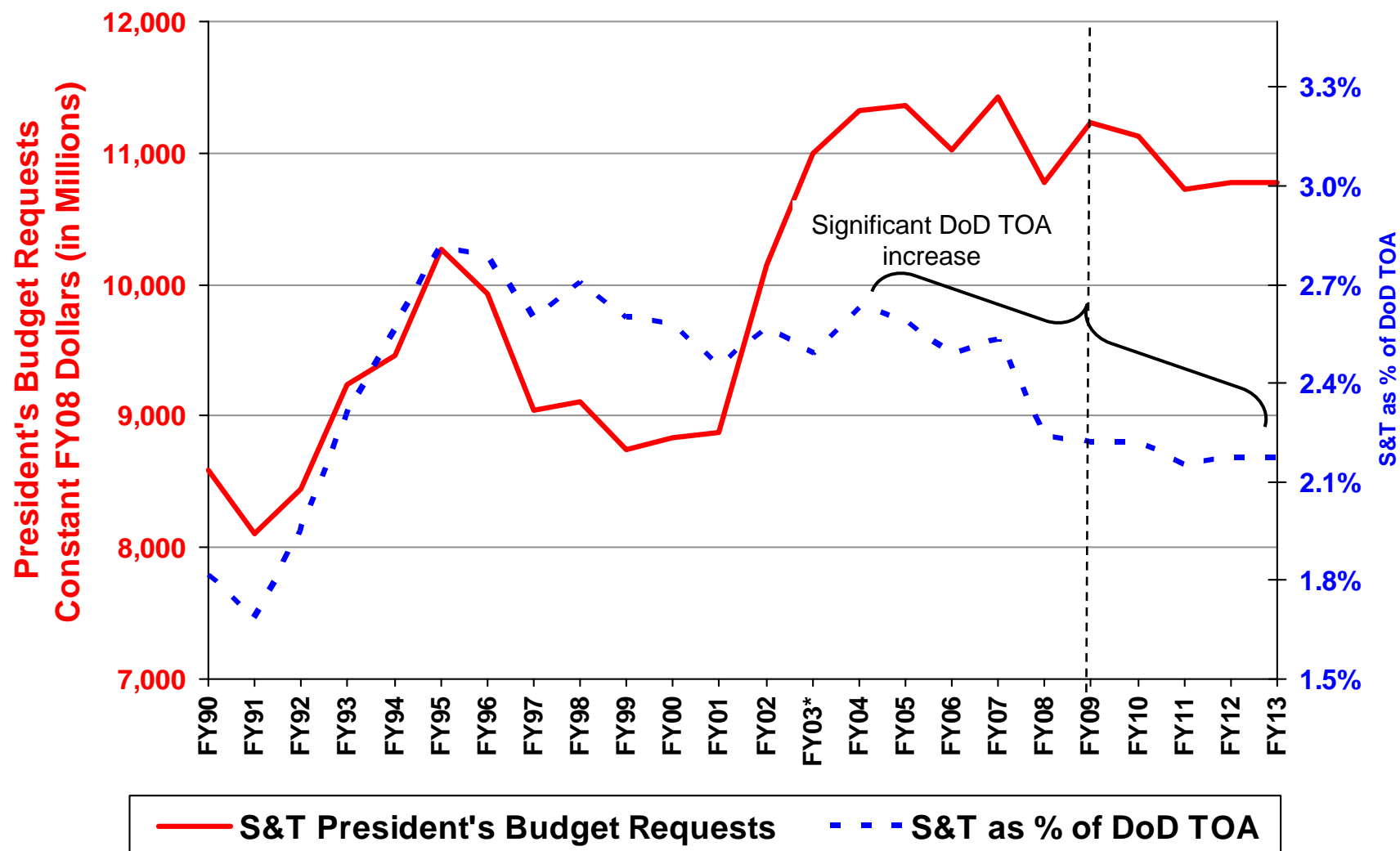
In FY03, includes \$203M allocated to Def Emergency Response Fund (DERF) S&T in a separate DoD transfer account

**FY09 S&T request is among the highest**



# DoD S&T - Macro Scale

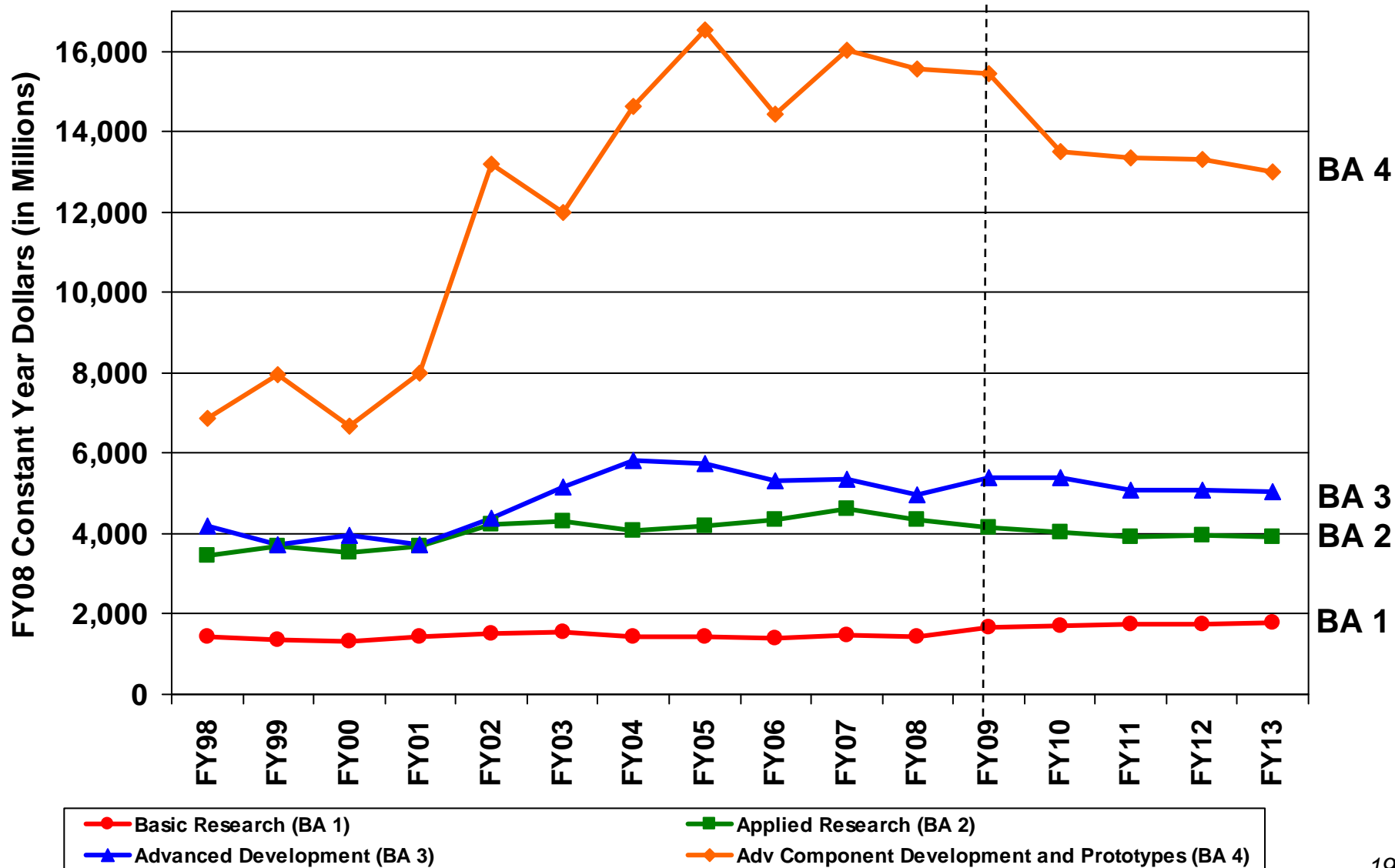
## - S&T Investment and % of DoD Total Obligational Authority (TOA) -



\*\* **Note:** FY03 includes DERF & Nuclear Posture Review funding

# DoD R&E Funding By Budget Activity

- President's Budget Requests  
(in FY08 Constant Dollars) -

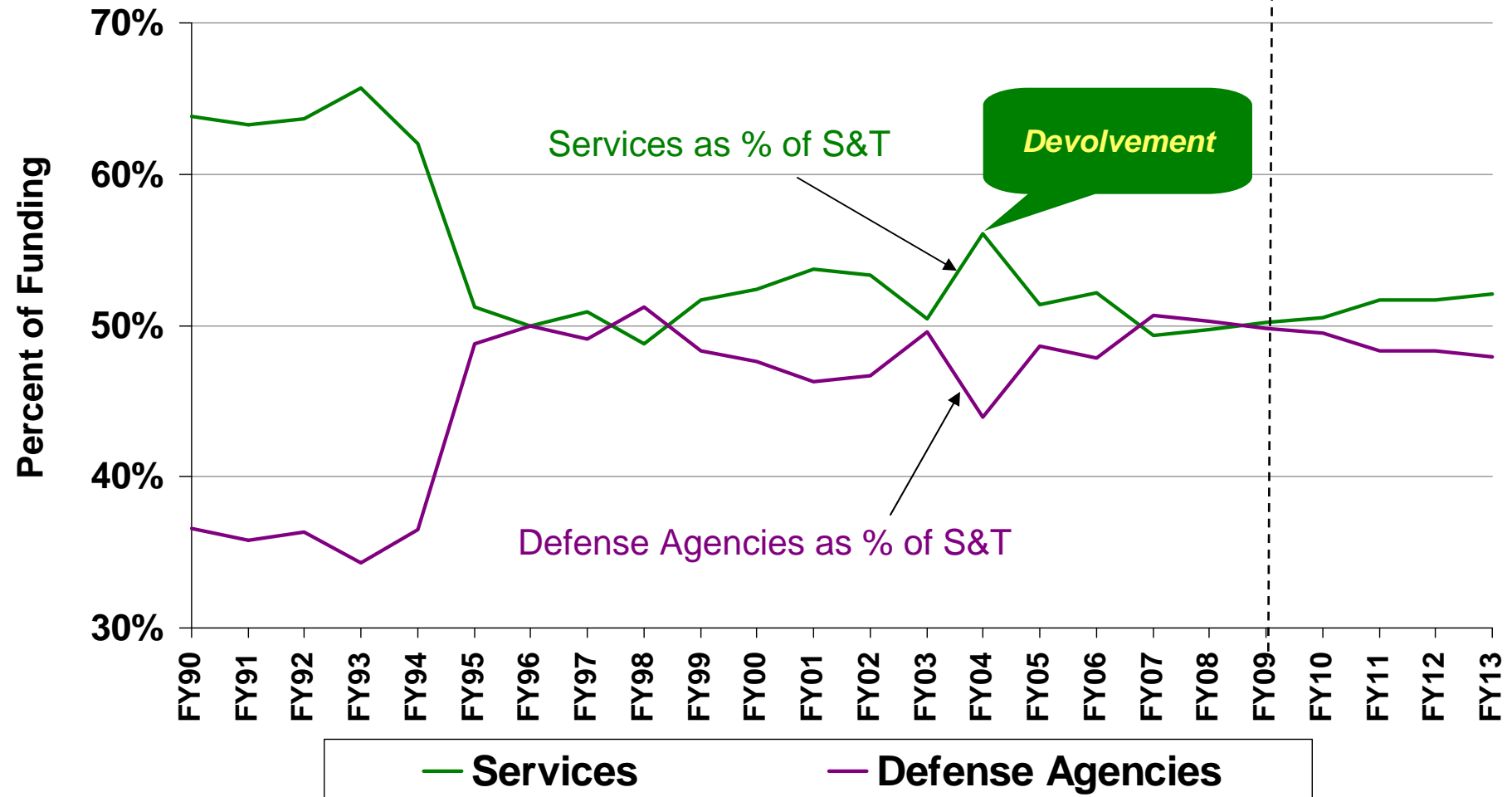


# S&T Breakout

## - Services and Defense Agencies as % of Total S&T -

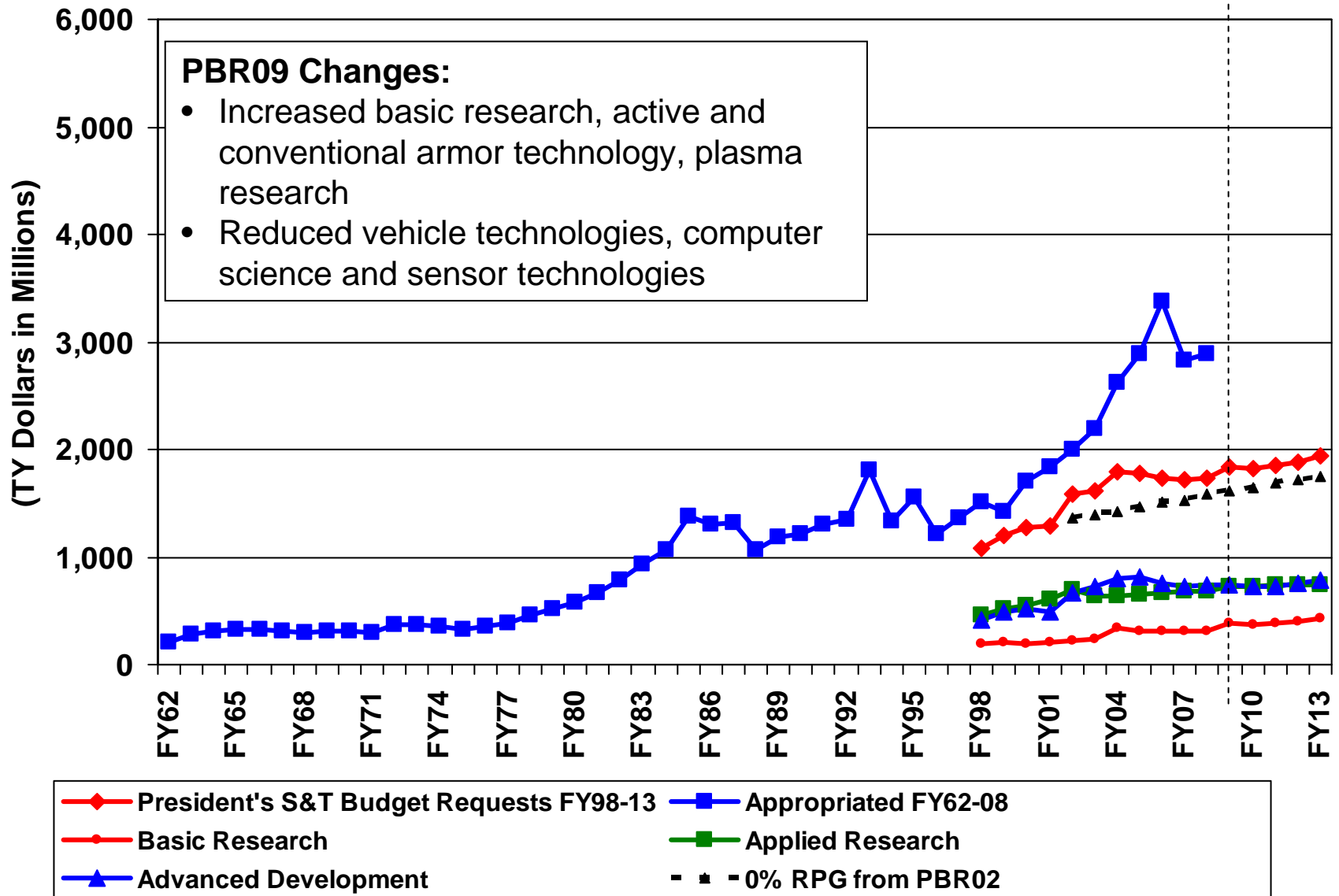


### President's Budget Requests



# Army S&T Funding

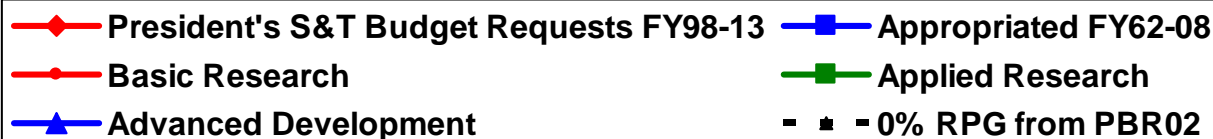
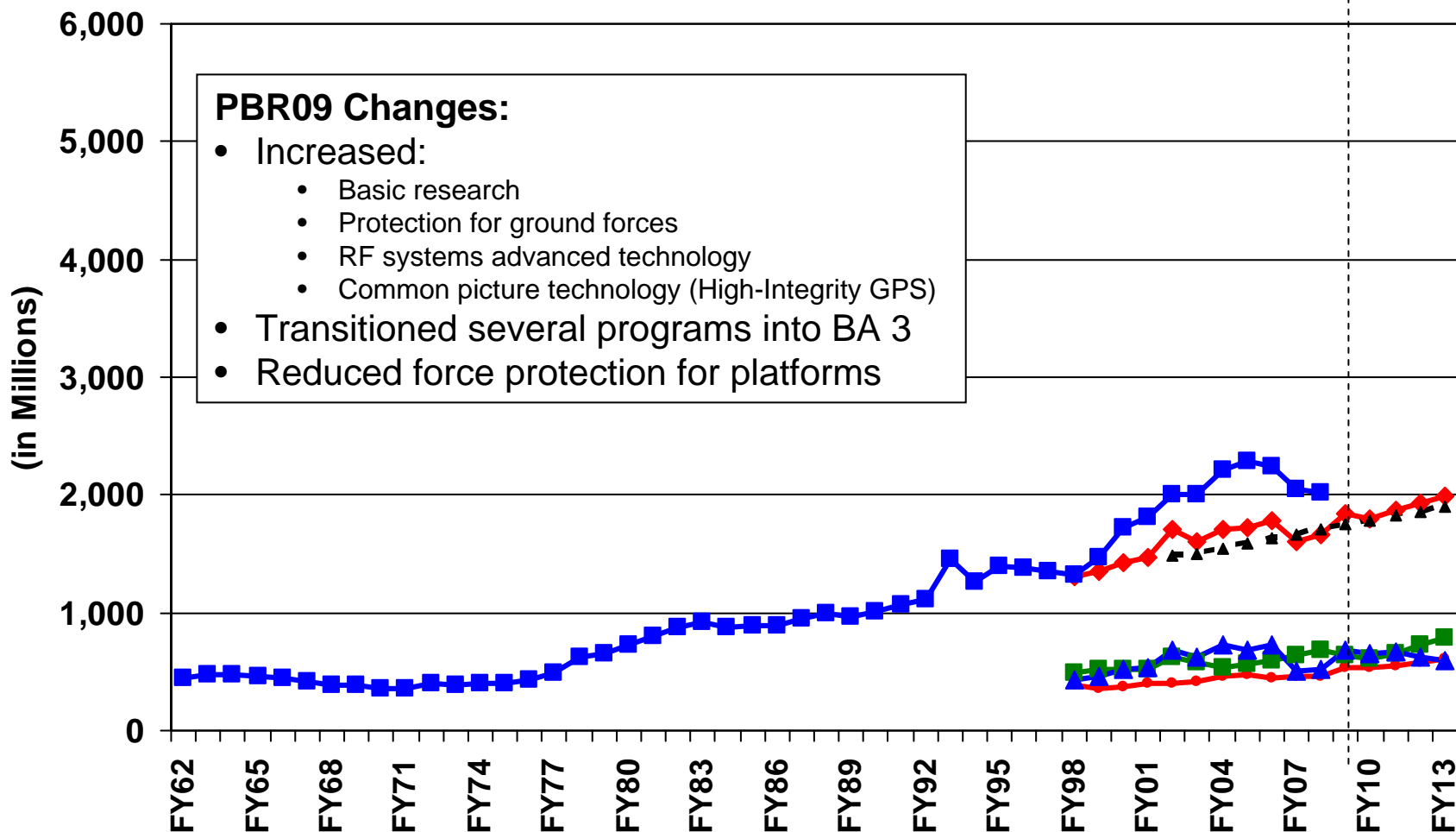
## - in Then Year Dollars -





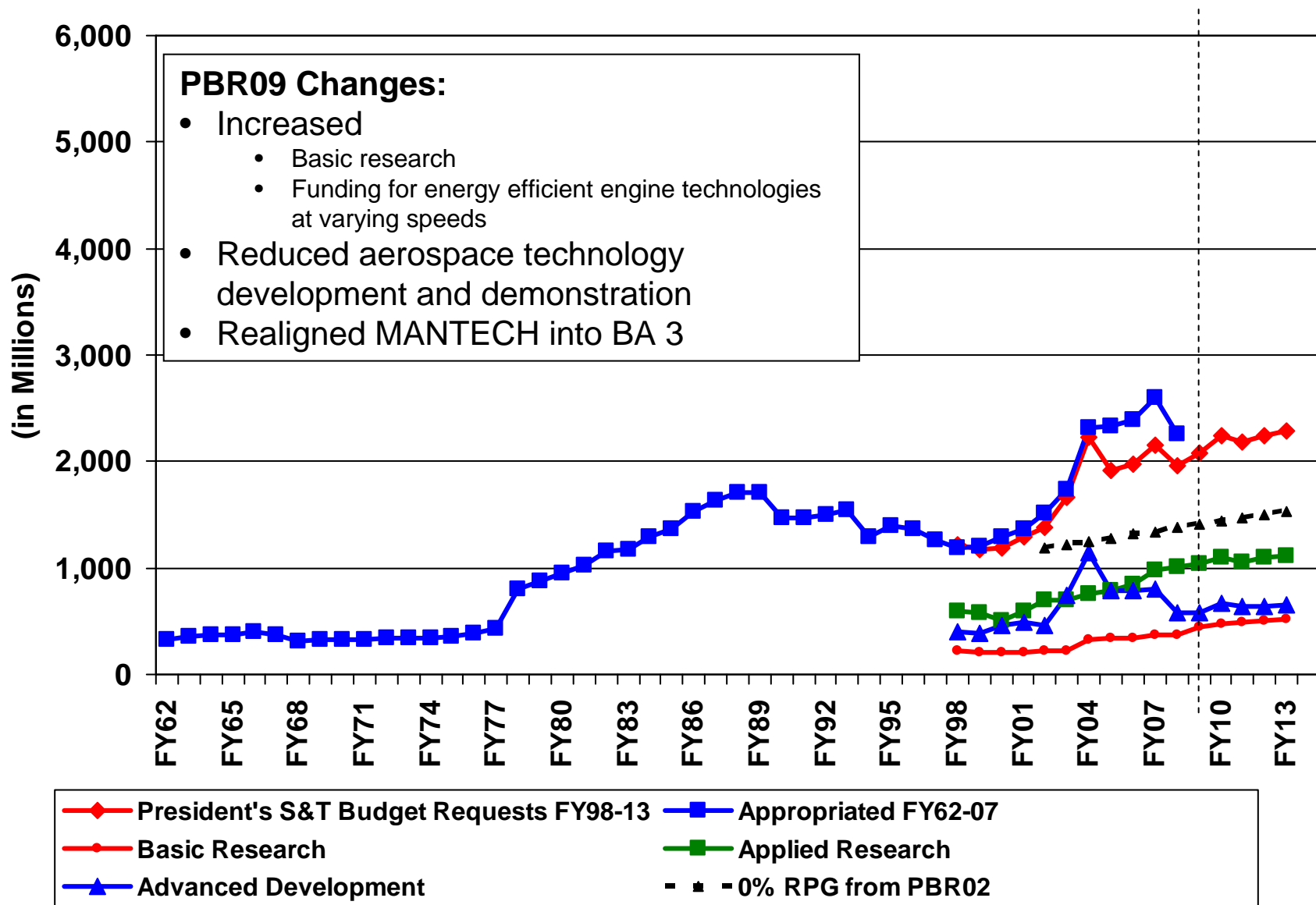
# Department of Navy S&T Funding

## - in Then Year Dollars -



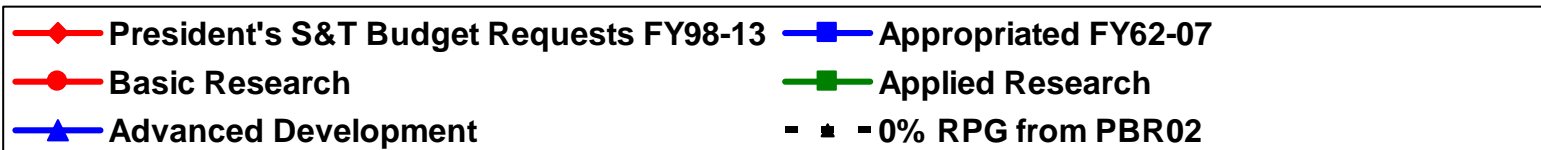
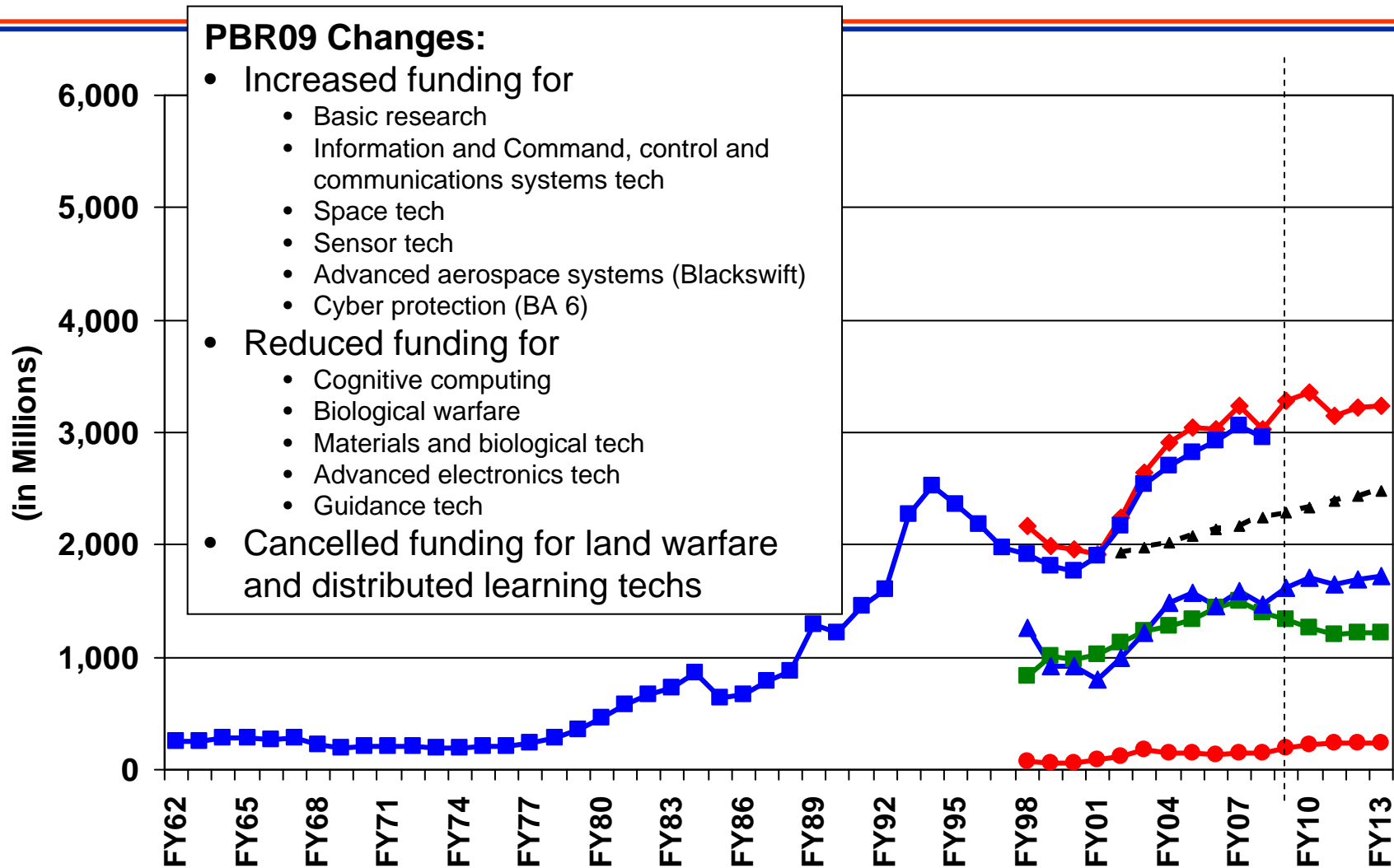
# Air Force S&T Funding

## - in Then Year Dollars -



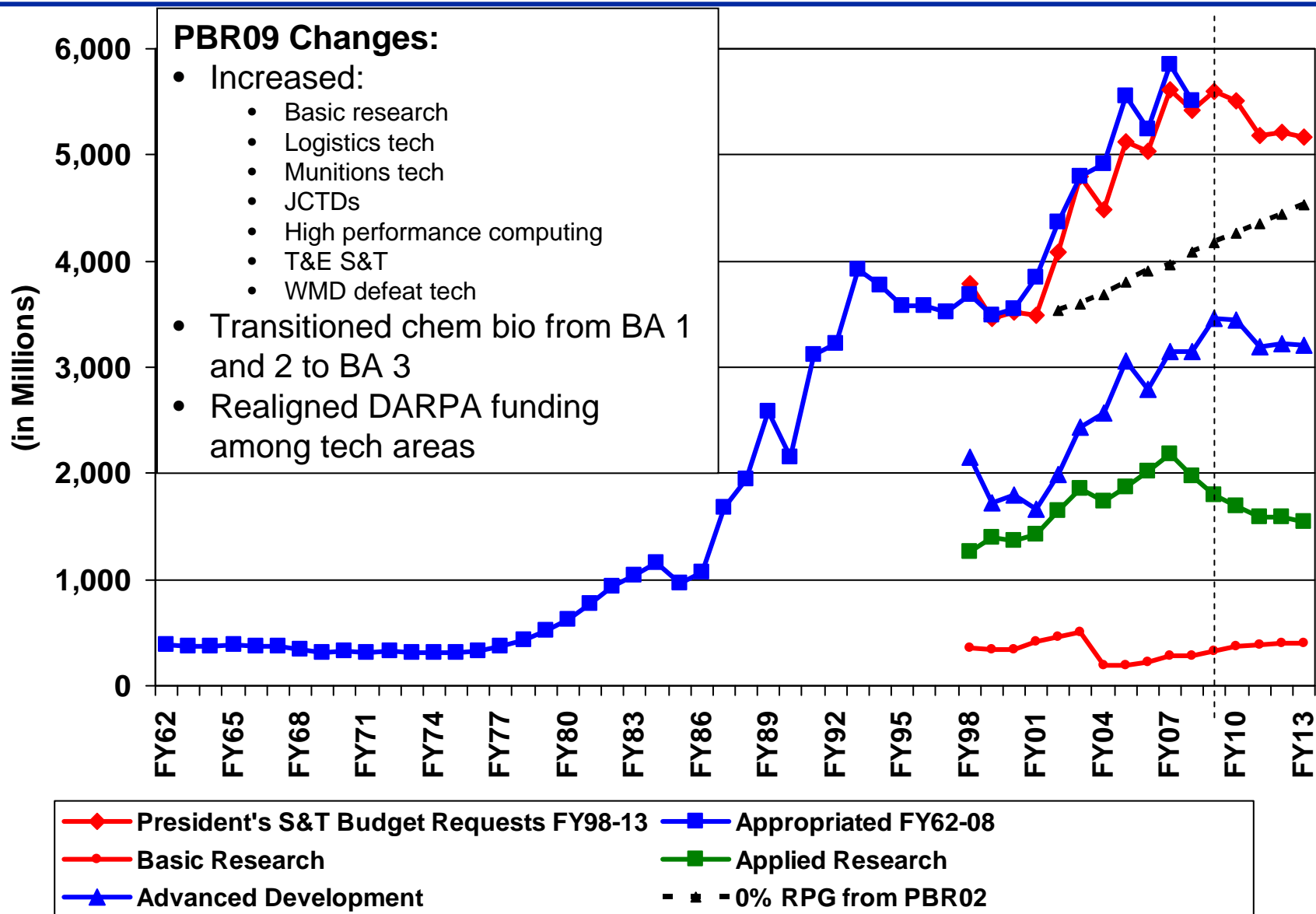
# DARPA S&T Funding

## - in Then Year Dollars -



# Defense-Wide S&T Funding

## - in Then Year Dollars -



# S&T Budget Observations

## - *Differences from FY08 Request* -



### Army

- Increased
  - Basic research
  - Active and conventional armor technology
  - Plasma research
- Reduced
  - Combat vehicle and automotive advanced technologies
  - Advanced tactical computer science and sensor technologies

### Navy

- Increased
  - Basic research
  - Protection for ground forces
  - RF systems advanced technology
  - Common picture technology (High-Integrity GPS)
- Transitioned several programs into BA 3
- Reduced force protection for platforms

# S&T Budget Observations (Cont'd)

## - Differences from FY08 Request -



### Air Force

- Increased
  - Basic research
  - Funding for energy efficient engine technologies at varying speeds (Highly Efficient Embedded Turbine Engine, Adaptive Versatile Engine Technology, materials technology)
  - Hypersonics (Blackswift) \*\*
- Realigned MANTECH into BA 3 - 0603680F
- Reduced aerospace technology development and demonstration

**Note:** Air Force Blackswift funded in Airborne Reconnaissance (PE 0305206F)

# S&T Budget Observations (Cont'd)

## - Differences from FY08 Request -



### Defense-wide

- Increased
  - Basic research for the National Defense Education Program and remote detection of fissile materials
  - Logistics technologies (TRANSCOM as distribution process owner)
  - Munitions technologies
  - JCTDs
  - High performance computing
  - T&E S&T
  - WMD defeat technologies
  - Cyber protection
  - Advanced aerospace systems (Blackswift)
- Transitioned chem bio from BAs 1 and 2 to BA 3
- Realigned DARPA funding among tech areas





# Strategic Context

# Strategic Framework

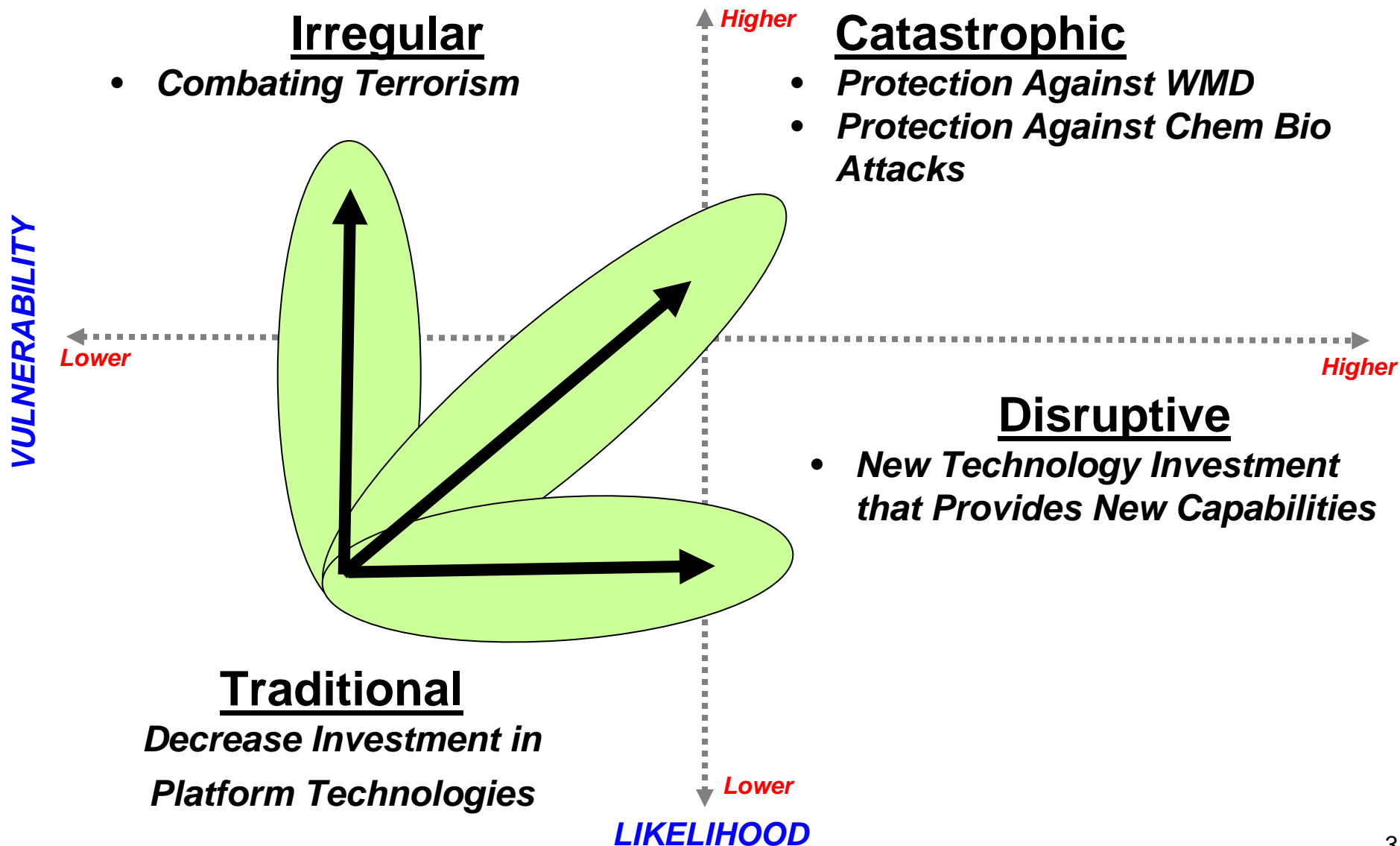


- **National Security Strategy of United States (Sept 2002) set national imperative to defend against WMD**
- **National Security Strategy also introduced the following terms:**
  - Traditional
  - Irregular
  - Catastrophic
  - Disruptive

***Transformational***
- **Concept validated in 2006 Quadrennial Defense Review**



# National Defense Strategy Drives Investment Strategy

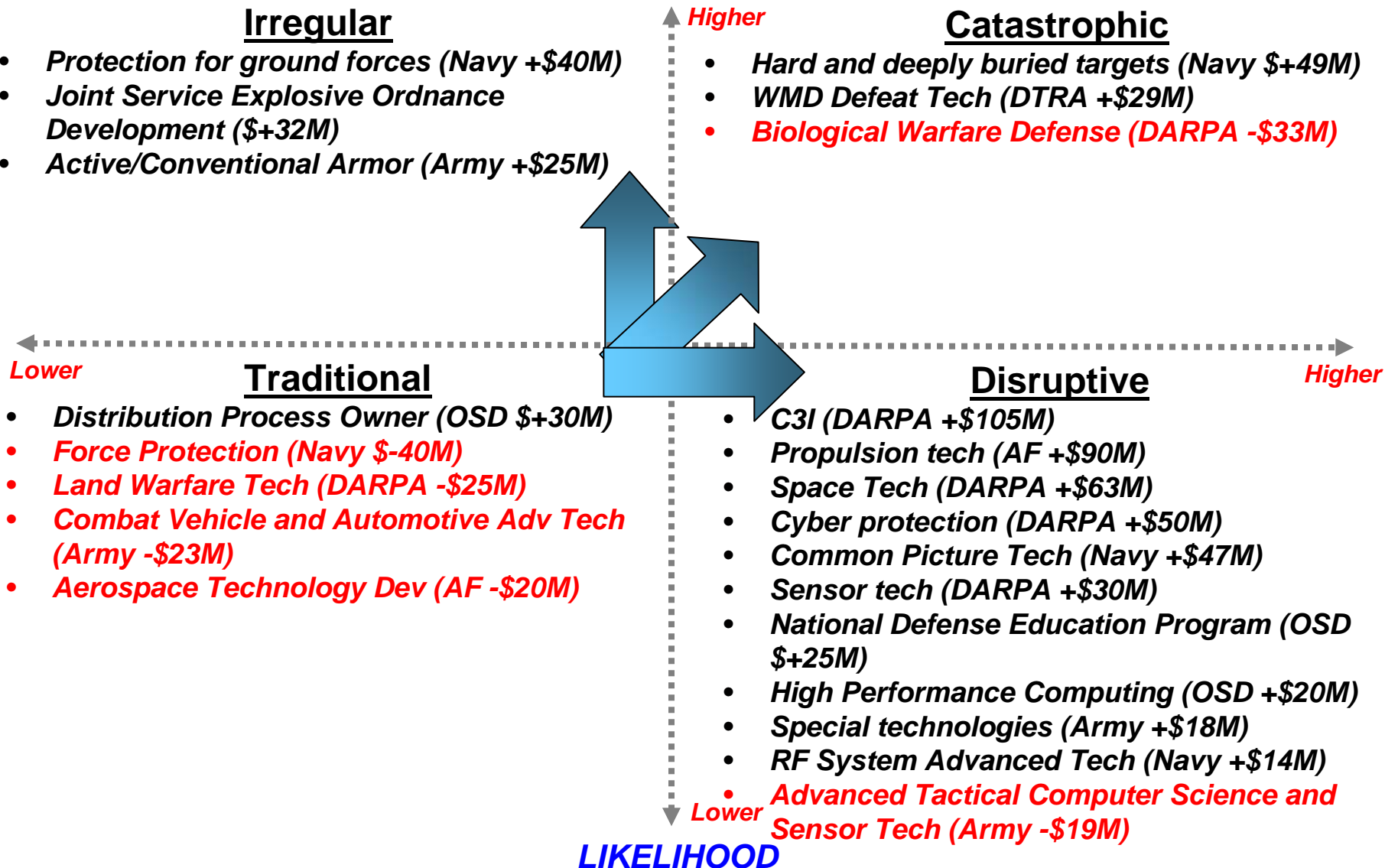


# R&E Funds Transformational Technologies



- *Investment Priority Changes (Non-Space Programs)*  
from PBR08 to PBR09 -

VULNERABILITY



LIKELIHOOD

Basic Research underpins all areas (+\$270M)



# DDR&E Programs

# DDR&E PBR09 Programs

## - Then Year Dollars -



BA	PE	PE Title	FY2008 Enacted	FY2009	FY2010	FY2011	FY2012	FY2013
1	0601111D8Z	Government/Industry Co-sponsorship of University Research (GICUR)	6,200	0	0	0	0	0
1	0601114D8Z	Defense Experimental Program to Stimulate Competitive Research (DEPSCoR)	17,078	2,833	0	0	0	0
1	0601120D8Z	National Defense Education Program (NDEP)	44,372	68,972	91,484	114,122	127,771	130,136
2	0602000D8Z	Joint Munitions Technology	12,542	15,254	15,371	15,250	15,453	15,671
2	0602227D8Z	Medical Free Electron Laser	2,400	0	0	0	0	0
2	0602228D8Z	Historically Black Colleges and Universities and Minority Institutions (HBCU/MI)	37,790	15,156	15,426	15,706	15,915	16,140
2	0602234D8Z	Lincoln Laboratory	29,524	31,340	31,954	31,003	31,417	31,860
2	0602670D8Z	Human, Social and Culture Behavior Modeling (HSCB)	6,300	7,685	9,609	9,902	16,539	18,818
3	0603000D8Z	Insensitive Munitions Advanced Technology	4,000	15,970	20,802	17,824	22,779	24,760
3	0603002D8Z	Medical Advanced Technology	0	0	0	0	0	0
3	0603225D8Z	Joint DoD/DOE Munitions	23,488	23,727	23,701	23,823	24,141	24,481
3	0603618D8Z	Joint Electronic Advanced Technology	12,419	9,320	9,529	9,851	9,982	10,122
3	0603648D8Z	Joint Capability Technology Demonstration (JCTD)	204,252	206,337	201,975	195,537	198,276	201,211
3	0603662D8Z	Networked Communications Capabilities	15,000	39,923	28,727	26,302	26,697	27,266
3	0603665D8Z	Biometrics Science and Technology	10,200	10,579	11,194	11,981	12,182	15,054
3	0603670D8Z	Human, Social and Culture Behavior Modeling (HSCB)	3,000	9,381	11,689	12,080	20,204	22,978
3	0603680D8Z	Defense-Wide Manufacturing Science and Technology Program (DWMS&T)	23,800	11,981	14,906	19,853	19,856	24,808
3	0603711D8Z	Joint Robotics/Autonomous Systems	19,756	8,449	9,276	10,435	11,634	11,973
3	0603716D8Z	Strategic Environmental Research and Development Program (SERDP)	69,674	69,038	70,438	71,388	72,338	73,357
3	0603727D8Z	Joint Warfighting	11,060	11,098	11,339	11,509	11,662	11,826
3	0603745D8Z	Synthetic Aperture Radar (SAR) Coherent Change Detection (CDD)	3,500	7,984	4,953	0	0	0
3	0603750D8Z	Advanced Concept Technology Demonstration (ACTD)	1,600	0	0	0	0	0
3	0603755D8Z	High Performance Computing Modernization Program (HPCMP)	206,807	208,079	215,278	200,933	211,363	218,506
3	0603781D8Z	Software Engineering Institute (SEI)	25,951	31,244	31,870	32,441	32,909	33,403
3	0603826D8Z	Quick Reactions Special Projects (QRSP)	114,234	113,924	114,565	108,421	109,865	111,413
3	0603828D8Z	Joint Experimentation	108,177	114,947	117,571	118,813	120,396	122,093
3	0603832D8Z	Joint Wargaming Simulation Management Office	22,837	38,147	39,208	40,027	40,559	41,130
3	0603942D8Z	Defense Technology Link (TechLink)	5,834	2,170	2,259	2,259	2,275	2,303
4	0604648D8Z	Joint Capability Technology Demonstration (JCTD)	2,960	14,962	18,911	18,886	19,917	19,959
4	0604670D8Z	Human, Social and Culture Behavior Modeling (HSCB)	1,000	5,991	7,132	7,823	12,875	15,621
4	0604787D8Z	Joint Systems Integration Command	19,375	19,643	20,098	20,360	20,631	20,921
4	0604828D8Z	Joint Fires Integration & Interoperability	16,596	16,906	17,277	17,449	17,681	17,930
5	0604051D8Z	Defense Acquisition Challenge Program (DACP)	28,970	30,363	30,882	31,002	31,416	31,859
5	0605140D8Z	Trusted Foundry	43,604	42,360	41,953	41,587	42,141	42,735
5	0605648D8Z	Defense Acquisition Executive (DAE)	5,838	5,883	5,850	5,810	5,888	5,970
6	0605110D8Z	Militarily Critical Technology Program (MCTP)	4,021	4,007	4,007	3,978	4,031	4,087
6	0605130D8Z	Foreign Comparative Testing (FCT)	32,919	34,910	35,719	34,381	34,839	35,330
6	0605798D8Z	Defense Technology Analysis	13,727	11,040	11,215	11,432	11,589	11,733
6	0605799D8Z	Force Transformation	20,585	20,701	21,361	21,679	22,022	22,362
6	0605801KA	Defense Technical Information Center (DTIC)	51,515	52,696	54,674	56,353	57,246	58,142
7	0607828D8Z	Joint Integration and Interoperability	53,893	49,371	48,108	47,705	48,340	49,022
TOTAL DDR&E PORTFOLIO			1,336,797	1,382,370	1,420,311	1,417,906	1,482,829	1,524,977



# Summary

- **PBR09 shows SecDef's commitment to a strong S&T program – especially basic research**
  - Focused on key technical challenges
  - With flexibility to address emerging technology areas
- **PBR09 is four percent higher than the PBR08 request, in real terms**
  - PBR09 request is within \$200M of highest request (PBR07), adjusted for inflation
  - SecDef directed significant increase in basic research (+16% higher than PBR08, adjusted for inflation)
  - Investment shifted to QDR-highlighted capabilities